

Sudden paraplegia during preoperative thoracic epidural catheterization

Cheng-Chun Liao MD (Resident) ^a

King-Chuen Wu MD (Staff Anesthesiologist) ^a

Yu-Cheng Liu MD (Staff Anesthesiologist) ^a

Rick SC Wu MD (Associate Professor) ^a

Kar-Lok Wong MD, PhD (Associate Professor) ^{a, b, *}

^a Department of Anesthesiology, China Medical University and Hospital, Taichung, Taiwan

^b Institute of Clinical Medical Science, China Medical University, Taichung, Taiwan

*Corresponding author. Department of Anesthesiology, China Medical University and Hospital, No. 2, Yuh-Der Road Taichung 404, Taiwan. Tel: +886-4-22052121 ext 3550; Fax: +886-4-22052121ext 3598.

E-mail address: klwong@mail.cmuh.org.tw (KL Wong)

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Abstract:

We report a case of sudden onset of paraplegia during thoracic epidural catheterization and discuss the possible causes of this event. A 38-year-old woman presented to receive a right liver lobectomy for hepatocellular carcinoma. Thoracic epidural analgesia for post-operative pain control was administered before the induction of anesthesia. After skin disinfection and local anesthetic skin injection with lidocaine, epidural catheterization was performed. In the first attempt, dural puncture was noticed without any neurological symptoms and the epidural space was successfully identified in the second attempt. However, acute motor weakness and sensory impairments were noticed as epidural catheter was being treaded into the epidural space before any local anesthetic was administered through the epidural catheter. Magnetic resonance imaging (MRI) revealed no abnormal findings and the neurological deficits resolved spontaneously within two hours without any sequels. Finally, it is supposed that the transient neurological deficits occurred was a result of accidental subarachnoid injection of the local anesthetics used for skin infiltration. Preoperative image studies of the spine and injection needle of shorted length for skin local infiltration could be helpful to avoid such complication.

Key Words: Thoracic epidural analgesia; paraplegia; local infiltration.

1. Introduction

Thoracic epidural analgesia has been proved to provide better post-operative analgesia than intravenous analgesia after thoracic and major abdominal surgeries. [1] It also decreases postoperative morbidity and mortality because it can provide better dynamic analgesia, early mobilization, less stress response, early extubation, less pulmonary complications, and earlier return of bowel function. [2] However, epidural analgesia can lead to severe complications, including spinal hematoma formation, spinal cord injury, infection, cauda equina syndrome or paraplegia. [3] We report a patient who experienced a sudden onset of paraplegia during thoracic epidural catheterization without any local anesthetic introduction. The possible etiologies of this complication and its prevention will be discussed.

2. Case report

A 38-year-old woman (weight, 44 kg; height, 160 cm) was scheduled to undergo a right liver lobectomy for hepatocellular carcinoma. Her medical history and physical examination results were generally unremarkable, except for hepatitis B virus infection. She had no history of back pain or any problems of the spine. Evaluation of coagulation profiles, including prothrombin time, activated partial thromboplastin time and platelet count were all within normal limits. With the patient's consent, we performed epidural catheterization for postoperative pain control before induction of anesthesia. The patient was placed in a left

lateral decubitus position. After skin disinfection, 3 mL of 2% lidocaine was infiltrated subcutaneously via a paramedian approach (1 cm lateral to the midline) at the interspace between T10 and T11 using a 10 mL syringe with a 22 gauge needle. The needle was inserted at an angle of about 15° slightly inward to the sagittal plane and upward 60° to the long axis of the spine. The 3 mL lidocaine was administered along the injection tract. After skin infiltration, an 18 gauge epidural Tuohy needle (B. Braun, Melsungen, Germany) was inserted to a depth of 3 cm from the skin, some clear free-flowing cerebrospinal fluid was seen coming out from the Tuohy needle. The needle was removed immediately under the impression of dura puncture and the patient was evaluated for the possibility of any neurological impairments. Since there were no shooting pain, no paresthesia, no headache and other neurological symptoms, the procedure was attempted again 2 minutes afterwards. The epidural space was then successfully identified with the technique of loss of resistance at a depth of 3 cm at the interspace between T9 and T10. As the epidural catheter was being threaded cephalad (approximately 5 minutes after the previous dural puncture), the patient experienced nausea and bilateral numbness below the level of the thighs. Physical examination revealed bilateral leg weakness and hypotension (BP of 90/45 mm Hg). A decrease of cold sensation below the level of T10 and bilateral lower extremity motor weakness (muscle power 1/5) were also found. There was no respiratory or consciousness impairments. Accordingly, the catheter was removed and the patient was put in the

Trendelenburg position. After fluid challenge and intravenous ephedrine therapy, blood pressure was restored to 103/60 mmHg. Surgery was postponed and neurology consultation revealed no deep tendon hyper-reflexia or any Babinski's sign. Magnetic resonance imaging (MRI) study on the thoracic spine was performed revealing no evidence of spinal cord injury, epidural hematoma, ischemic changes, or spinal stenosis. (Fig 1) About 2 hours after the dura puncture, lower extremity muscle power, sensations to pinprick and light touch were fully recovered. Although neurological symptoms and signs improved, intravenous dexamethasone 4 mg was still given every eight hours for one day to prevent possible delayed spinal cord edema. The operation was postponed for one week, at which time she underwent right liver lobectomy and received postoperative intravenous postoperative pain control. The patient was discharged one week later with a smooth course.

3. Discussions

Neurological injury is a rare but serious complication of thoracic epidural catheterization. [4] The damage may result from direct epidural needle or catheter trauma, spinal hematoma formation, cord infarction, epidural abscess, or local anesthetic neurotoxicity. [5] In addition to abnormal neurological symptoms, MRI plays an important role in the diagnosis of neurological injury due to thoracic epidural catheterization. [6,7,8] During the insertion of the Touhy needle and the advancement of the epidural catheter, the patient did not complain of

any shooting pain or paresthesia, however, it is possible that improper technique could have led to delayed onset of symptoms due to spinal cord injury. [6] However, there were no abnormal MRI findings and the patient had a quick recovery profile. We do not have solid evidence to indicate that our patient's neurological symptoms were caused by direct needle or epidural catheter trauma during the procedure or the symptoms were due to previous existing spinal cord disease. Local anesthetic toxicity can be ruled out because local anesthetic had not been administered through the epidural catheter when the incident occurred.

This patient's symptoms and abnormal neurological findings resolved spontaneously within two hours. Upon reviewing of the MRI of this patient, we found that the vertical distance from the skin to the dura was only about 2.5 cm from the midline at the level of T10. (Fig 1) The estimated depth from the skin to the epidural space via the paramedian approach is about 3 cm according to the principles of trigonometry ($2.5 / \cos 15^\circ \times \cos 30^\circ$). However, the length of the 22 gauge syringe needle used for local infiltration was 3.2 cm. Based on these findings; we hypothesize that a portion of the 3mL of the 2% lidocaine used for local infiltration might have gone directly into the subarachnoid space, thereby causing the transient neurological deficits that occurred in this patient.

Paramedian approach of thoracic epidural catheterization is a common technique for many anesthesiologists. [9] Lai et al. reported that the average thoracic epidural depth in the Chinese population via the paramedian approach was 5.11 ± 0.94 cm (mean \pm SD), with the

shorter distance representing that at the lower thoracic levels (T10-12: 4.86 cm vs T6-9: 5.20 cm). [10] The depth was positively correlated to body weight and body mass index but was unrelated to sex, age, or body height. [10,11] According to Lai's model, the estimated epidural depth in our patient via the paramedian approach is 4.57 cm at the level of T10, which is still well above the measured distance (Fig 1 & 2) and the estimated distances via the paramedian approach (respectively 3 cm and 3.2 cm). The skin-to-dura distance estimation model was not applicable in our case and this predictive model for estimating the skin to epidural distance should be used with caution. We advise that CT or MRI images should be reviewed carefully if available to measure the actual from the skin-to-epidural distance before epidural catheterization proceeds. [11]

In summary, we report a patient who developed neurological deficits during thoracic epidural catheterization. Unintentional subarachnoid injection of local anesthetic used for local skin infiltration might be a reasonable cause of this complication. To avoid this, we advise using an injection needle with shorter length for skin local infiltration and reconfirmation of the needle position before administering the local anesthetics. Furthermore, avoidance of too deeply infiltration of local anesthetic before epidural catheterization should always keep in mind, and if possible to take advantage of image studies to estimate the skin-to-epidural distance before the procedure might be helpful to prevent such complication during thoracic epidural catheterization procedure.

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Fig 1

Legends:

Fig. 1 Thoracic MRI and measured distance (black line) from the skin to epidural spaces at the level of T10 (2.5 cm).

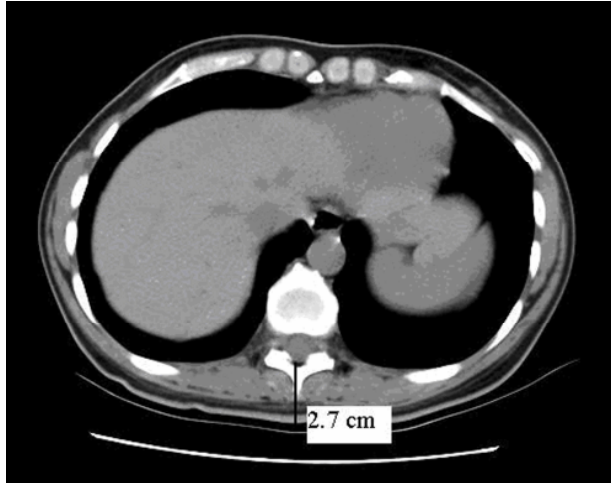


Fig. 2

Legends:

Fig. 2 The CT scan and measured distance (black line) from the skin to epidural space at the level of T10 (2.7 cm).